

evaluation shall contain the following information and investigation, at a minimum:

(a) The location, soil survey, soil cation exchange capacity and soil nutrient content information as specified for landspreading systems in sub. (4).

(b) A sufficient number of soil test pits shall be excavated to adequately define the soil conditions found on the site.

1. Prior to soil test pit construction, the treatment site owner or operator and the department shall agree on the number and location of test pits to be excavated dependent upon the size of the land treatment site and uniformity of soils and geology.

2. The soil test pits shall be large enough to allow visual inspection and documentation of soil layers and shall be excavated to a depth of 5 feet below the final base grade of the system. The U.S. occupational health and safety administration requires that test pits with more than 5 feet of standing wall shall not be entered unless provision is made to prevent caving of the walls.

3. The department shall be notified at least 24 hours prior to excavation of the soil test pits to allow inspection by department personnel.

(c) Soil samples from the test pits shall be collected and analyzed at each significant change in soil characteristics or lithology for the following:

1. Soil textural classification in accordance with the unified soil classification system as specified in ASTM standard D-2487-85.

2. Particle size analysis performed in accordance with ASTM D422-72 to determine particle size distribution. With department approval, soil samples may be composited, or the particle size determined by a sieve analysis to reduce repetitive testing of similar soil samples.

3. The soil moisture holding capacity by direct measurement or as specified through reference to literature values for different soil textures.

(d) Following soil sample collection, the test pits shall be deepened to the extent practical with a backhoe to check for bedrock, the water table or for soil layers that would restrict the downward movement of water. This shall be visual check from the land surface, unless the test pits are protected from caving in accordance with U.S. occupational safety and health administration requirements. All soil test pits shall be refilled with excavated material following deepening for the bedrock, water table and impervious layer check.

(6) TREATMENT SYSTEMS WITH REQUIRED GROUNDWATER MONITORING. For land treatment systems where groundwater monitoring wells are required, the soils evaluation shall contain the following information and investigation, at a minimum:

(a) A preliminary site investigation report shall be assembled that contains the site location, soil survey, soil cation exchange capacity and soil nutrient content information as specified for landspreading systems in sub. (4). Also, a limited number of test pits may be constructed to provide preliminary soils information, such as that specified in sub. (5).

(b) The treatment system owner or operator shall submit the results of the preliminary site investigation and propose a full scale treatment site investigation plan.

(c) The full scale treatment site investigation shall consist of a combination of soil test pits and soil borings to adequately define the soil, groundwater and bedrock conditions at the site.

1. Prior to construction of test pits and soil borings, the treatment site owner or operator and the department shall agree on the number and location of soil borings and test pits dependent upon the size of the site and uniformity of soils and geology.

2. The soil test pits shall be investigated as specified in sub. (5).

3. The soil sampling in borings shall be performed in accordance with ASTM D1586-84 or ASTM D1587-83.

4. The soil borings shall extend to the groundwater table, be terminated upon encountering bedrock, or be drilled to a minimum depth agreed upon in the preliminary site investigation plan. The department may require the borings to extend to a minimum depth of 25 feet below the final base grade of the land treatment system when groundwater or bedrock is not encountered first.

(d) Soil samples which are above the normal groundwater level and are contained in the unsaturated zone shall be collected from the test pits and soil borings and analyzed at each significant change in soil characteristics or lithology as specified in sub. (5) (c). Hydrogeologic testing requirements are specified in s. NR 214.21 (2) (e).

(7) HIGH RATE ABSORPTION POND SYSTEMS. For absorption pond systems having a design hydraulic application rate greater than 10,000 gpd/acre, the minimum soil, groundwater and bedrock related information and requirements are those listed in sub. (6), with the following additional requirements:

(a) At least 2 saturated hydraulic conductivity tests shall be performed on the soils located at the final base grade of the system using a field permeability test. In some cases, the department may allow laboratory permeability tests on hydrated and saturated samples compacted at the same approximate density as exists in the in-field condition. These laboratory tests may be performed on molded or core samples, and separate tests shall be performed using tap water, wastewater or sludge extract. The permeability shall be based on stabilized inflow and outflow rates during the test. All preparation work and information detailing the test apparatus shall be submitted along with all results obtained.

(8) DATA PRESENTATION. The results from the subsurface investigation shall be presented in accordance with ch. NR 108 as follows:

(a) Existing site conditions and surrounding natural and man-made conditions shall be presented on a baseline topographic map.

(b) Cross-sections shall be developed and presented to illustrate subsurface geologic and geomorphic conditions. At least one cross-section shall be developed parallel to groundwater flow. The cross-sections shall present documented and inferred stratigraphic, soil, groundwater and

bedrock conditions of the site. Soil test pit and soil boring information shall be correlated to each cross-section developed.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90; am. (5) (c) 1., Register, April, 1991, No. 424, eff. 5-1-91.

NR 214.21 Groundwater monitoring requirements. (1) APPLICABILITY. The department may require the generator of a liquid waste, the owner or operator of a liquid waste land treatment system or an independent liquid waste-handling contractor, if applicable, to design and install a groundwater monitoring well system depending upon the type and strength of liquid waste, the volume of discharge, the type of land treatment system, the rate of discharge to the land treatment system and the site characteristics of the land treatment system. This section applies to discharges of liquid wastes and does not apply to sites used for spreading sludge or by-product solids; groundwater monitoring may be required around sludge or by-product solid spreading sites in special cases as specified in s. NR 214.05.

(a) For land treatment systems which receive liquid wastes and have a flow to land treatment equal to or greater than 1.0 million gallons per day, the generator of the wastewater, the independent contractor who uses the system or the owner or operator of the system shall install a comprehensive multi-level groundwater monitoring system. The monitoring system shall contain one or more well nests to monitor groundwater elevation, flow and quality.

(b) For absorption pond, ridge and furrow, spray irrigation and sub-surface absorption systems which receive any type of liquid waste and have a flow to land treatment of 15,000 gallons per day or more, but less than 1.0 million gallons per day, the generator of the wastewater, the independent contractor who uses the system or the owner or operator of the system shall install a single level groundwater monitoring system.

(c) The department may require the generator of the liquid waste, an independent contractor who uses the system or the owner or operator of a land treatment system which receives any flow of liquid wastes to install a single level or a multi-level groundwater monitoring well system. Factors to be considered for this determination include waste strength and characteristics, volume of waste, dosage schedule, geology of the area (depth to groundwater and bedrock), soil type, and the ratio of the groundwater flow velocity to the hydraulic application rate.

(d) The department may waive the requirement to install a groundwater monitoring well system for a land treatment system. Factors to be considered for granting this waiver may include: whether the system is operated at nutrient and hydraulic application rates which do not exceed the agronomic needs of the cover crop, whether the geology, soils and proposed hydraulic loading rate indicate that groundwater contamination is unlikely, the ratio of the groundwater flow velocity to the hydraulic application rate and the density of the waste material.

(2) DESIGN, CONSTRUCTION, INSTALLATION, TESTING, DOCUMENTATION AND ABANDONMENT OF MONITORING WELLS. (a) Groundwater monitoring systems shall be installed in accordance with approved plans and specifications. The department will accept plans and specifications prepared by and submitted under the signature of a qualified hydrogeologist, soil scientist, engineer or other qualified individual. Qualifications shall include a degree from an accredited institution of higher education and field ex-

perience on soil investigation, interpretation and classification of geologic or hydrogeologic information.

(b) Minimum acceptable standards for the design, construction, installation, documentation, development and abandonment of groundwater monitoring wells shall be in accordance with ch. NR 141.

(c) The groundwater monitoring well system shall consist of an adequate number of wells to define groundwater flow direction and to judge the groundwater impacts from land treatment on the site. A background monitoring well shall be located upgradient and far enough away from the land treatment system that no impact from the treatment system is measured. The other monitoring wells shall be located downgradient from the land treatment system in the possible directions of groundwater flow. In the event the groundwater flow direction is not known, the department may require the downgradient wells to be installed approximately equal distance from each other and around the perimeter of the system.

(d) Downgradient groundwater monitoring wells shall be located at least 10 feet beyond the outer edge of the waste application area. The department may require monitoring wells to be placed within, at or beyond the land treatment system design management zone.

(e) The groundwater monitoring wells shall be tested to provide information on the hydrogeology of the site.

1. The saturated hydraulic conductivity of the aquifer around at least 3 of the monitoring wells shall be estimated by performing in-field tests. All preparation work, analysis and information describing the use of the in-field test shall be submitted along with the results obtained. The test shall be of sufficient duration and include enough data to provide a representative estimate of the actual hydraulic conductivity.

2. The horizontal and, if possible, the vertical hydraulic gradient shall be calculated using measured groundwater elevations from on-site wells.

3. The aquifer thickness and type of bedrock shall be determined through use of reliable reference material or by actual measurement.

(e) As-built plans shall be submitted to the department after the wells are installed. The plans shall contain the following information:

1. A map shall be drawn to a specific scale and indicate the location of the land treatment system, all well location and elevation requirements as specified in s. NR 141.065, and the direction of groundwater flow. Land surface contours of the land treatment system and the elevations of the groundwater shall be referenced to the U.S. geological survey or the U.S. national geodetic survey.

2. Well and borehole construction documentation listed in s. NR 141.23.

(3) PLAN MAP. An 8½" by 11" plan map drawn to scale according to a horizontal grid system shall be submitted that indicates the location of the land treatment system, the adjacent property boundaries and the location of all wells, wetlands, streams and lakes within 0.5 miles of the land treatment system.